REMARKS

Claims 1-5, 8-12, 14 and 21-29 are now before the Examiner for consideration.

In the final Office Action dated June 4, 2003 in the parent application, the Examiner rejected Claims 1-3, 8-10 and 14 under 35 U.S.C. Section 103(a) "as being unpatentable over Sekido et al. (U.S. Pat. No. 4,314,996) in view of Niedrach et al. (U.S. Pat. No. 4,627,907)." Specifically, the Examiner asserted that:

> Regarding claims 1 and 2, Sekido et al. teach a gas sensor comprising: a catalytically active element in electrical communication with a measurement circuit (see col. 1, lines 1 - 65, col. 3, lines 31 - 68 & col. 4, lines 1 - 37). Sekido et al. do not specifically teach the incorporation of a measurement circuit including a thermistor network to facilitate compensation for the changes in ambient temperature to the resistance of the catalytically active element. Sekido et al. do teach that where temperature dependency presents a problem, it is necessary to incorporate a thermistor for temperature compensation (see col. 5, lines 15 - 31). Niedrach et al. do teach a gas sensor which incorporates the use of a thermistor network to compensate for temperature variations (see col. 2, lines 21 - 68, col. 3, lines 1 - 68 & col. 4, lines 1 - 26). Therefore, it would have been obvious to one of ordinary skill in the art to incorporate the thermistor network for a gas sensor, as taught by Niedrach et al., with the gas sensor, as taught by Sekido et al., in order to facilitate effective temperature compensation for the gas sensor and thereby provide stable and reliable gas concentration measurements. Furthermore, regarding claims 2 and 9, Niedrach et al. teach that the thermistor network includes a thermistor and at least one resistor (see col. 4, lines 18 - 26). Regarding claims 3 and 10, Niedrach et al. teach that the thermistor network includes a first resistor (146) in series electrical connection with the thermistor (148) and a second resistor (150) in parallel electrical connection with the thermistor (148) (see col. 4, lines 18 - 26). Regarding claim 14, it should be noted that these claims are directed to an apparatus. Therefore, it is the structural limitations of the apparatus, as recited in the claims, which are considered in determining the patentability of the apparatus. Claim 14 recites a process limitation, which is accorded no patentable weight to an

> apparatus. The instant claim recites that the heat loss from thermal conduction is less than approximately 10% .of the heat generated by a reaction catalyzed at the active element at full scale. This recitation does not impart any limitations to define the structure of the apparatus being claimed. It is unclear as to what structural limitation of the gas sensor imparts this heat loss limitation. Process limitations do not add patentability to a structure, which is not distinguished from the prior art. A recitation of the intended use of the claimed invention must result in a structural difference between the claimed invention and the prior art in order to patentably distinguish the claimed invention from the prior art. If the prior art structure is capable of performing the intended use, then it meets the claim. In a claim drawn to a process of making, the intended use must result in a manipulative difference as compared to the prior art. See In re Casey, 152 USPQ 235 (CCPA 196/) and In re Otto, 136 USPQ 458, 459 (CCPA 1963). The applicant is advised that the structure which goes to make up the device must be clearly and positively specified. The structure must be organized and correlated in such a manner as to present a complete operative device. Therefore, claim 14 should recite the characteristics of the physical structure, e.g., the geometric surface area of the catalytically active element, which imparts the recited characteristic of the apparatus which limits heat loss from thermal conduction.

Applicants respectfully traverse the Examiner's rejection.

Sekido et al. and Niedrach et al., respectively, disclose a semiconductor oxide sensor for the detection of oxygen and an electrochemical sensor for the detection of oxygen, and not a combustible gas sensor as claimed in the present invention. While Sekido et al. and Niedrach et al. do describe temperature compensation using thermistors, it is only in oxygen sensors, not combustible sensors. As is clear to one skilled in the art, the oxygen of sensors of Sekido et al. and Niedrach et al. are very different in both design and operation from the catalytic combustible gas sensors claimed in the present invention.

The need to compensate for ambient temperature change in all types of chemical sensors, including electrochemical and semiconductor oxide sensors as described in Sekido et al. and Niedrach et al., is well known. However, prior to the present invention

catalytic combustible gas sensors required "compensation" for temperature and for ambient changes other than temperature to provide a reliable sensor output. In a number of respects, a catalytic combustible gas sensor is similar to a thermometer in that the catalytic combustible gas sensor measures the heat released when a small amount of combustible gas is burned on its surface. Because phenomena other than ambient temperature change, most notably heat losses via conduction to the surroundings, can also impact the temperature of the sensor, the compensator elements of prior catalytic combustible gas sensors must account for such phenomena. For example, in addition to compensating for ambient temperature changes, prior to the present invention, the compensator elements of combustible gas sensors compensated for differences in the thermal conductivity of the gas-phase environment. Most often, those changes are related to differences in relative humidity. Such compensators or compensating elements are matched closely to the active element and thus substantially increase the expense of combustible gas sensors. As set forth on page 2 of the specification:

> The characteristics of compensating pelement 50 are typically matched as closely as possible with active pelement 40. Compensating pelement 50, however, typically either carries no catalyst or carries inactivated catalyst.

Surprisingly, the present inventors have discovered that a thermistor, network, which is inherently very different from the catalytically active element or the matched compensators of known combustible gas sensors, can be used under certain conditions to compensate for temperature alone. For example, if the catalytically active element of a combustible gas sensor of the present invention is sufficiently small, the thermal conductivity response fades into the noise and one can compensate for only temperature, which can be done more cost-effectively using a thermistor network than by using a matched compensating element. It is counterintuitive and contrary to the teachings followed by those skilled in the art that a thermistor network can be used in a combustible gas sensor in place of the compensating element, wherein the characteristics of the compensating element are much more similar to the characteristics of the catalytically active (sensing) element, including its

thermal conductivity response. The use of a thermistor in the combustible gas sensors and in the measuring circuits of the present invention is thus novel and nonobvious. Once again, the present inventors are the first to discover that a thermistor network, which is very dissimilar to the catalytically active sensing element of a combustible gas sensor, can effectively and correctly compensate sensor output for changes in temperature in the combustible gas sensors of the present invention by itself.

Applicants are not claiming to be the first to use a thermistor to compensate for temperature changes. However, Applicants are the first to enable the use of a thermistor network to compensate for ambient temperature changes in a catalytic combustible gas sensor and the first to eliminate the need for a matched compensating element in a catalytic combustible gas sensor.

With respect to Claim 14, the Examiner is incorrect in the assertion that the "recitation does not impart any limitations to define the structure of the apparatus being claimed." Moreover, it is clear to one skilled in the art what structural limitation of the gas sensor can impart the heat loss limitation of Claim 14 to the present invention. Indeed, the overall heat loss from thermal conduction from a system is a physical characteristic of that system. The only way to effectively change the heat loss is to change the structure of the system. For example, the geometric surface area of the catalytically active element of the present invention can be kept sufficiently small to limit the heat loss from thermal conduction.

The limitation that "heat loss from thermal conduction is less than approximately 10% of the heat generated by a reaction catalyzed at the catalytically active element at full scale" of Claim 14 is neither a process limitation nor a recitation of intended use as incorrectly asserted by the Examiner. In setting forth that limitation, Applicants are doing no more than setting forth structure with the use of

"functional" language. It is well established that there is no basis for the proposition that such "'functional' language, in and or itself, renders a claim improper." In re Swinehart, 439 F.2d 210, 169 USPQ 226 (CCPA 1971). As set forth by the Court of Customs and Patent Appeals:

> We take the characterization 'functional' ... to indicate nothing more than the fact that an attempt is being made to define something ... by what it ***does*** rather than by what it ***is*** (as evidenced by specific structure or material, for example). In our view, there is nothing intrinsically wrong with the use of such a technique in drafting claims. Indeed we have even recognized in the past the practical ***necessity*** for the use of functional language. See, for example, In re Halleck, 421 F.2d 911, 57 CCPA 954 (1970).

In re Swinehart, F.2d at 212-213 (emphasis in original). The Examiner cannot continue to impermissibly ignore this express claim limitation. See Ex Parte Murphy and Burford, 217 USPQ 479, 481 (P.O. Bd. Appls. 1982) ("it is error to ignore specific limitations distinguishing over the cited reference"); In re Boe, 505 F.2d 1297, 184 USPQ 38 (CCPA).

In view of the above remarks, Applicants respectfully request that the Examiner withdraw his rejection of the claims, indicate the allowability of Claims 1-5, 8-12, 14 and 21-29 and arrange for an official Notice of Allowance to be issued in due course.

CERTIFICATE OF MAILING

I hereby certify that this correspondence and any document referred to as enclosed herein are being deposited with the United States Postal Service as first class mail in an envelope addressed to the Commissioner for Patents, Alexandria, Virginia 22313-1450.

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Date of Deposit

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